

PATENT ABSTRACTS OF JAPAN

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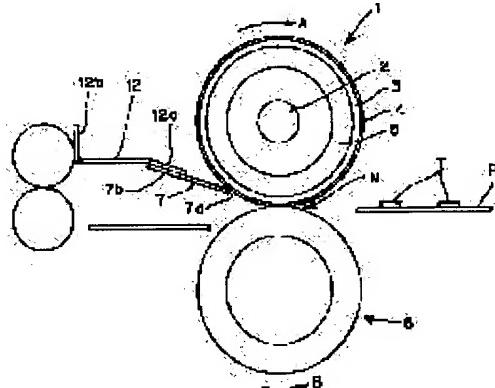
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(54) FIXING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a fixing device provided with a peeling sheet made possible to perform the stable peeling without damaging an image, paper sheet and a fixing roll.

SOLUTION: This fixing device is provided with the fixing roll 1 rotated in the direction of the arrow A, on a surface of which an elastic layer 3 is foamed, the pressure roll 6 rotated in the direction of the arrow B, while held in contact with the fixing roll 1, the peeling sheet 7 composed of plastic for peeling the paper sheet P allowed to pass through a nip part N from the fixing roll 1 surface provided on the downstream side than the nip part N in the rotary direction A, being held in contact with the fixing roll 1 surface by the end edge thereof.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the fixing equipment used for the image recording equipment of electrophotography methods, such as an electronic copying machine and facsimile.

[0002]

[Description of the Prior Art] Conventionally, make the nip section of the roll of a couple which consists of a fixing roll and a pressure roll pass the form with which the toner image was imprinted, and the fixing equipment which makes a toner image weld to a form by heating with a fixing roll and pressurization with two rolls is widely used for it as fixing equipment to which the toner image imprinted on the form fixes in the image-recording equipment of electrophotography methods, such as an electronic copying machine and facsimile.

[0003] Generally, by this fixing method, since the toner image welded to the form contacts a fixing roll, the roll which coated the front face with the good fluorine system resin of a mold-release characteristic as a fixing roll is used. However, even if it uses such a fixing roll, since [that it is soft and] the fused toner has high viscosity, it has a possibility that a form may coil that it is easy to adhere to a fixing roll front face. Then, the method of usually forming the compulsive ablation equipment by the ablation presser foot stitch tongue as shown below, and preventing coiling round of the form to a fixing roll is adopted.

[0004] Drawing 10 is the outline block diagram of conventional fixing equipment equipped with the compulsive ablation equipment by the ablation presser foot stitch tongue.

[0005] The fixing roll 1 having the heater 2 which this fixing equipment rotates in the direction of arrow A as shown in drawing 10, From the nip section N which the pressure roll 6 which contacts the fixing roll 1 and rotates in the direction of arrow B, and two rolls 1 and 6 come to contact, to the hand-of-cut downstream of the fixing roll 1 The edge contacts the front face of the fixing roll 1, and it has the ablation presser foot stitch tongue 10 which exfoliates the form P which passed the nip section N from the fixing roll 1. Usually, a rubber covered roll is used as a pressure roll 6, and it is arranged so that the fixing roll 1 may be pressed by the predetermined pressure.

[0006] As an ablation presser foot stitch tongue 10, conventionally, heat resistant resins, such as a polyimide and a polyphenylene ape fight, are cast, and a finishing thing is used for a sharp configuration in the nose of cam. It is installed so that such an ablation presser foot stitch tongue 10 may be pressed against the front face of the fixing roll 1 using a spring. The width of face of the edge which touches fixing roll 1 front face of the ablation presser foot stitch tongue 10 is about 2mm, and it is common that the narrow ablation presser foot stitch tongue 10 of such width of face is arranged at about 5-6 shaft orientations of the fixing roll 1. Thus, since the ablation presser foot stitch tongue 10 does not touch the front face of the fixing roll 1 partially, in fixing roll 1 front face, the uneven press force is applied to the shaft orientations of the fixing roll 1 by the ablation presser foot stitch tongue 10, and fixing roll 1 front face may carry out partial wear, or may attach a blemish to a front face. Moreover, when a form is caught in any one ablation presser foot stitch tongue in two or more ablation presser foot stitch tongues and produces coiling round of a form, in response to the unusual force according [an adjoining ablation presser foot stitch tongue] to a form, it is strongly pushed on the fixing roll 1, or an ablation presser foot stitch tongue deforms, a big blemish may be attached to fixing roll 1 front face, or partial wear may be generated.

[0007] Then, in order to solve such a problem, the fixing equipment which exfoliates a form with the ablation sheet of plastics as shown below is indicated by JP,59-188681,A. Drawing 11 is the outline block diagram of conventional fixing equipment equipped with the compulsive ablation equipment by the ablation sheet of

plastics.

[0008] The fixing roll 1 which this fixing equipment rotates in the direction of arrow A as shown in drawing 11 and with which the heater 2 was built in, From the nip section N which the pressure roll 6 which contacts the fixing roll 1 and rotates in the direction of arrow B, and two rolls 1 and 6 come to contact, to the hand-of-cut downstream of the fixing roll 1 The edge contacts the front face of the fixing roll 1, and it has the ablation sheet 11 which exfoliates the form P which passed the nip section N from the fixing roll 1. In the ablation sheet 11, they are 0.05mm or more in thickness, and bending elastic-modulus 103 kg/cm². Above, the sheet plastic of 150 degrees C or more of melting points is used, and it is arranged so that the sharp edge may contact equally the whole front face of the shaft orientations of the fixing roll 1.

[0009]

[Problem(s) to be Solved by the Invention] However, with fixing equipment equipped with such an ablation sheet, like [at the time of monochrome image formation], although it can exfoliate satisfactorily when [that the thickness of the toner image immediately after fixing is comparatively thin and] the viscosity of a toner image is large, for example When the thickness of the toner image immediately after fixing is comparatively thick, and a toner image is heated by the elevated temperature with a fixing roll like [at the time of color picture formation] and adhesion is large The phenomenon of a lot of toners having adhered to the fluorine system resin layer of a fixing roll front face, the excessive ablation force acting on the edge of the ablation sheet of a thin film, an ablation sheet nose of cam producing plastic deformation, and being turned over, and it becoming impossible to exfoliate a form may be caused. Moreover, simultaneously with it, the nose of cam of a form also receives a big injury, and may have been turned over, it may lenticulate, or a paper jam may be caused. In especially fixing of a full color picture, in order to use the toner of a Magenta, yellow, cyanogen, and four colors of black, the non-established toner image with which a lot of toners than the time of fixing of monochrome picture were imprinted [they piled them up and] and formed must be established, and the big ablation force is required at the time of ablation. Furthermore, since it is required to make a toner fully color in fixing of a color picture, a toner must fully be heated for the reason, and melting must be carried out, therefore the toner immediately after nip section passage serves as hypoviscosity, the still bigger ablation force will be needed.

[0010] Although deformation of the thickness of 200 micrometers or more, then an ablation sheet can prevent an ablation sheet in order to make it an ablation sheet not deform, even if the big ablation force is applied to an ablation sheet, the edge portion of the edge of an ablation sheet will be several or more times the thickness of the form which should exfoliate, and it becomes impossible to exfoliate a form stably. Moreover, if thickness of an ablation sheet is thickened too much, a possibility that the flexural rigidity of an ablation sheet may become large and may damage a fixing roll will also be produced.

[0011] When two or more ablation presser foot stitch tongues currently used abundantly at fixing of the conventional monochrome picture are used instead of using an ablation sheet, a toner image is damaged by the ablation presser foot stitch tongue, and a problem [as / in an above-mentioned ablation sheet] tends to produce a picture defect, since the toner image after fixing is compulsorily removed by the ablation presser foot stitch tongue, although it does not generate. Therefore, a color picture is not almost compulsorily removed by the ablation presser foot stitch tongue.

[0012] From such a situation, a self stripping method is adopted as fixing of a color picture in many cases. A self stripping method is an ablation method with which it was made for a form to exfoliate with nature from a fixing roll in the nerve of a form, and the elasticity of a fixing roll, without using the compulsive ablation equipment by the ablation presser foot stitch tongue, the ablation sheet, etc. In color picture fixing, as a means for forming this self stripping method, the method which usually always supplies the oil of a large quantity (more than 10 mg/A4 size paper) to the elastic layer front face comparatively further using the fixing roll in which the elastic layer using silicone rubber excellent in the mold-release characteristic was formed, rather than a fluoroiresin on the front face of a roll core is adopted widely.

[0013] However, there are the following various problems in the conventional fixing equipment which attains self stripping.

(1) The elastic layer of the silicone rubber of a fixing roll front face may be worn out, a mold-release characteristic may deteriorate, or the reliability of a fixing roll may be reduced according to the cause of oil

sinking into the interior of a fixing roll, and degrading an elastic layer.

(2) Oil must be supplied periodically, and it is inferior to maintenance nature, and is unsuitable for a small copying machine and a small printer.

(3) It is easy to reduce the retouch nature in a ball-point or ink on a copy that oil tends to remain. this invention aims at offering fixing equipment equipped with the ablation sheet which can perform ablation stabilized without doing an injury to a picture, a form, and a fixing roll in view of the above-mentioned situation.

[0014]

[Means for Solving the Problem] The 1st fixing equipment of this invention which attains the above-mentioned purpose It has the 1st body of revolution which has a heat source inside and is rotated in the predetermined direction, and the 2nd body of revolution rotated in the direction where the hand of cut of the 1st body of revolution is opposite while contacting the 1st body of revolution. It pressurizes, while heating the form which supports a non-established toner image on the front face of the side in contact with the 1st body of revolution by which these two body of revolution has been conveyed by the nip section which comes to contact mutually. In the fixing equipment fixed to the above-mentioned form in a non-established toner image the 1st body of revolution of the above An elastic layer is formed in a front face. rather than the above-mentioned nip section of the 1st body of revolution of the above to the hand-of-cut downstream of the 1st body of revolution The edge contacts the 1st body-of-revolution front face, and it is characterized by having the ablation sheet which exfoliates the form which passed the above-mentioned nip section from the body-of-revolution front face of the above 1st.

[0015] Moreover, the 2nd fixing equipment of this invention which attains the above-mentioned purpose It has the 1st body of revolution which has a heat source inside and is rotated in the predetermined direction, and the 2nd body of revolution rotated in the direction where the hand of cut of the 1st body of revolution is opposite while contacting the 1st body of revolution. It pressurizes, while heating the form which supports a non-established toner image on the front face of the side in contact with the 1st body of revolution by which these two body of revolution has been conveyed by the nip section which comes to contact mutually. While having the contact section which contacts the 1st body-of-revolution front face by the hand-of-cut downstream of the 1st body of revolution in the fixing equipment fixed to the above-mentioned form rather than the above-mentioned nip section of the 1st body of revolution of the above in a non-established toner image It has the configuration further prolonged in the hand-of-cut upstream of the 1st body of revolution rather than the contact section. The point prolonged in the upstream is characterized by having the ablation sheet which exfoliates the form which passed the above-mentioned nip section which it comes to arrange by separating a predetermined gap from the 1st body-of-revolution front face from the body-of-revolution front face of the above 1st.

[0016]

[Embodiments of the Invention] Hereafter, the operation gestalt of this invention is explained.

[0017] Drawing 1 is the outline block diagram of the 1st operation gestalt of the fixing equipment of this invention.

[0018] The fixing equipment shown in drawing 1 is equivalent to the 1st fixing equipment of this invention, and the hand of cut A of the fixing roll 1 is equipped with the pressure roll 6 which rotates in the opposite direction of arrow B, contacting the fixing roll 1 which rotates in the direction of arrow A, and the fixing roll 1. It pressurizes, while heating the form P which has been conveyed by the nip section N of the rolls 1 and 6 of these couples and which supports the non-established toner image T on a front face, and the non-established toner image T is fixed to Form P. From the nip section N of the fixing roll 1, the edge contacts fixing roll 1 front face, and the hand-of-cut A downstream of the fixing roll 1 is equipped with the ablation sheet 7 which exfoliates the form P which passed the nip section N from fixing roll 1 front face.

[0019] Here, the fixing roll 1 of this operation gestalt is equivalent to the 1st body of revolution said to this invention, and the pressure roll 6 of this operation gestalt is equivalent to the 2nd body of revolution said to this invention.

[0020] The fixing roll 1 covers the elastic layer 3 with a thickness of 0.5mm on the front face of the core 5 of aluminum, further, covers the surface layer 4 with a thickness of 20 micrometers, is formed on it, and has the

heater 2 as a heat source inside. With this operation gestalt, silicone level-status-register rubber (Liquid Silicone Rubber) with a rubber degree of hardness of 25 degrees is used as an elastic layer 3. Moreover, the PFA (Perfluoro-alkoxyfluoro plastics) tube is used as a surface layer 4.

[0021] In addition, you may use the elastic layer which can use a fluororubber in addition to silicone rubber, and consists of silicone rubber and a fluororubber as the quality of the material of the elastic layer 3 and by which two or more layer laminating was carried out. Drawing 2 is the cross section of the ablation sheet with which the fixing equipment of the 1st operation gestalt was equipped.

[0022] As shown in drawing 1 and drawing 2, the fluorine system resin layer 9 with a thickness of 10 micrometers is covered by edge 8c in contact with surface 8a of the base material 8 of polyimide resin with a thickness of 75 micrometers, and a base material 8, rear-face 8b, and the fixing roll 1, and the ablation sheet 7 is formed in it. Since the fluorine system resin resin layer 9 is formed, a PFA film can be used.

[0023] In addition, although polyimide resin is used as a base material 8 of the ablation sheet 7 with this operation gestalt, the base material 8 of the ablation sheet 7 is not limited to polyimide resin, and may use a heat-resistant sheet plastic or a heat-resistant metal sheet.

[0024] Edge 7a of the point contacts the fixing roll 1, and the ablation sheet 7 is arranged along with the tangential direction lengthened toward the direction of the hand of cut A of the fixing roll 1 from the contact. Edge 7a of the ablation sheet 7 has only the width of face in contact with the whole width of face of the shaft orientations of the fixing roll 1, and as for the ablation sheet 7, the back end section 7b is being fixed to point 12a of the metal support plate 12 so that the edge 7a may be forced on the front face of the fixing roll 1 by the 300g contact pressure. As for the support plate 12, the back end section 12b is being fixed to the frame (not shown) of this fixing equipment with the screw thread. Sufficient rigidity is secured, although the ablation sheet 7 is a thin sheet, since length from edge 7a of a point to back end section 7b is comparatively short-******(ed) with 2mm - about 7mm.

[0025] It is equivalent to the ablation force for exfoliating that heating pressurization tends to be carried out, and the toner image T on Form P tends to fuse the contact pressure of edge 7a of the ablation sheet 7, and the fixing roll 1 in the nip section N, and it tends to adhere to the fixing roll 1, and the pressure welding of the ablation sheet 7 needs to be carried out to the fixing roll 1 by the contact pressure which corresponds to the ablation force decided by the character of the toner image which should be established In addition, about the measuring method of the ablation force, it mentions later. Moreover, the contact pressure of the ablation sheet 7 and the fixing roll 1 is defined also in consideration of relevance with many following elements in addition to relevance with the above-mentioned ablation force.

[0026] First, flapping which produces the minimum value of a contact pressure in edge 7a of the heated ablation sheet 7 must be sufficient value to disappear, and the maximum of a contact pressure must be a value below the limitation which a blemish generates on the amount of marginal deflections, plastic deformation start load, or the fixing roll 1 of an ablation sheet. The practical optimum value of these restrictions to a contact pressure is within the limits of 100g-500g in A4 horizontal size form width-of-face:297mm.

[0027] When a heat-resistant sheet plastic is used as a base material of the ablation sheet 7, the thickness of the ablation sheet 7 for obtaining this contact pressure needs to be 50 micrometers or more. However, when the thickness of the ablation sheet 7 is set to 150 micrometers or more, since [in which Form P runs against edge 7a of the ablation sheet 7, and can exfoliate smoothly] it is lost, it is desirable [the practically optimal sheet thickness] that it is 50 micrometers - 150 micrometers.

[0028] Since the PFA film with a thickness of 10 micrometers is covered by edge 7a of the ablation sheet 7 in this operation gestalt, even if the toner image of the melting state immediately after fixing rubs the front face of the ablation sheet 7, the ablation sheet 7 is not damaged. This is because the contact pressure per unit area of the ablation sheet 7 becomes small since the toner image is supported all over edge 7a of ablation sheet 7 a. However, since a toner image is rubbed at the both ends of edge 7a of the ablation sheet 7, a line is attached to a toner image and a quality-of-image defect is generated when the width of face of the ablation sheet 7 is narrower than the width of face of Form P, the width of face of the direction of fixing roll axis of the ablation sheet 7 needs to cover the whole form width of face.

[0029] Although the toner and paper powder which were offset on the fixing roll 1 are scratched by edge 7a of the ablation sheet 7 and may be accumulated on the upper surface of the ablation sheet 7 near edge 7a with

the fixing equipment of this operation gestalt Since, as for edge 7a, the fluorine system resin is covered, the adhesion force to the ablation sheet 7 of a toner or paper powder is weak. Since it is removed by contacting the toner and paper powder with which the nose of cam of the form P supplied to the nip section N next was accumulated even if a toner and paper powder are accumulated somewhat, dirt is not accumulated so much. [0030] In addition, it is desirable to arrange the ablation sheet 7 aslant so that edge 7a of the ablation sheet 7 may be made to incline to the shaft orientations of the fixing roll 1 and fixing roll 1 front face may be contacted. Namely, by giving a 0.5mm - about 2mm difference for the distance from the both-sides edge of the cross direction of edge 7a to the nip section N at a both-sides edge, and arranging the ablation sheet 7 aslant to the shaft of the fixing roll 1 The impulse force which produces Form P at the time of an ablation start when it can begin to exfoliate gradually from one crosswise side edge and a solid black picture is near the nose of cam of Form P can be reduced, and it is desirable.

[0031] As mentioned above, the advantage of the compulsive ablation method by the ablation sheet which was not able to be used for color fixing although the 1st fixing equipment of this invention was conventionally used for monochrome fixing, The advantage of a self stripping method is combined. fundamentally While giving a self stripping pressure to a form by using the front face of a fixing roll as an elastic layer and reducing the ablation force of the form in color fixing to level of the same grade as the ablation force in monochrome fixing By carrying out the pressure welding of the ablation sheet to a fixing roll by the low contact pressure, it is going to realize the fixing equipment which can perform ablation stabilized without doing an injury to a picture, a form, and a fixing roll also by the case of color fixing.

[0032] The above-mentioned ablation force is measured by the following measuring device.

[0033] Drawing 3 is the outline block diagram of an ablation force measuring device.

[0034] As shown in drawing 3 , while this ablation force measuring device contacts the fixing roll 21 which rotates in the direction of arrow A like actual fixing equipment, and the fixing roll 21, the hand of cut A of the fixing roll 21 is equipped with the pressure roll 26 which rotates in the opposite direction B. In the interior of the fixing roll 21, the heater 22 is arranged as a heat source. It pressurizes, while heating the form P which has been conveyed by the nip section N of the rolls 21 and 26 of these couples and which supports the non-established toner image T on a front face, and the non-established toner image T is fixed to Form P.

[0035] The downstream of the hand of cut A of the fixing roll 21 is equipped with the ablation presser foot stitch tongue 23 which exfoliates the form P which passed the nip section N from fixing roll 21 front face from the nip section N of the fixing roll 21. Edge 23a of the ablation presser foot stitch tongue 23 is forced on fixing roll 21 front face by the contact pressure set up beforehand. The strain gage 24 is stuck on rear-face 23b of the ablation presser foot stitch tongue 23, and the contact pressure which acts on the ablation presser foot stitch tongue 23 at the time of carrying out forcible ablation of the fixing toner image after the form P which supported the non-established toner image T passes the nip section N by the ablation presser foot stitch tongue 23, i.e., the ablation force, is measured.

[0036] As concrete measurement conditions, a solid non-established test picture is formed in the Fuji Xerox A4 size S paper in width of face of 100mm, and picture size with a length of 80mm, it is established by form bearer rate 100 mm/sec with the fixing roll 21 set as the heating temperature of 10-degree-C interval in this solid non-established test picture, and a strain gage 24 detects the ablation force at that time. The fixing conditions at that time are as follows.

Fixing roll: The fluorine system resin coat hard roll which covered the PFA tube with a thickness of 20 micrometers to the aluminum core with a diameter of 40mm.

[0037] Pressure roll: The elastic body roll which covered silicone rubber with 3mm [in thickness], and a rubber degree of hardness of 60 degrees to the aluminum core with a diameter of 34mm.

[0038] Nip width : 6mm.

[0039] Toner : in monochrome toner, use and the toner weight per unit area are a toner for Vivace550 by F company 0.65 mg/cm² A color toner is ACOLOR by F company. Use and the toner weight per unit area are the toner which included 4 % of the weight and the polypropylene wax for the polyester wax in the toner for 620 1% of the weight 2.0 mg/cm²

[0040] The result measured using this measuring device is shown in Table 1, 2, and 3.

[0041]

[Table 1]

	トナー	トナー重量 (mg/cm ²)	画像光沢 (グロス)	最大剥離力 (g)
白黒定着 (フッ素樹脂ロール)	Vivace 550トナー	0.65	8	10
カラー定着 (フッ素樹脂ロール)	A Color トナー + Wax	2.0	80	130
		1.3	68	90
		0.65	60	50
		0.65	15	17

[0042] As shown in Table 1, when the so-called hard roll which coated the fluororesin is used as a fixing roll, in monochrome fixing, the maximum ablation force is increasing to 13 times as much 130g as monochrome fixing in color fixing to the maximum ablation force being 10g in the fixing allowable-temperature range.

Since the value of this maximum ablation force is a value over a test picture with a width of face of 100mm, in order to establish it in the color picture of 297mm width of face of A4 horizontal width size, the impulse force of about 400g will act on an ablation sheet at the moment of exfoliating. Therefore, there is a possibility that the ablation sheet with a thickness of 75 micrometers made from a polyimide may deform plastically, it may lenticulate in response to the injury also with the big nose of cam of a form, or a paper jam may occur.

[0043] In 297mm reduced property of 70g and A4 horizontal width size, it is confirmed that the critical load which can exfoliate stably without the plastic deformation and ***** of an exfoliation sheet arising according to the experiment of this invention persons, without the nose of cam of a form receiving damage is about 200g by the test picture with a width of face of 100mm.

[0044] Moreover, as for the toner weight and the maximum ablation force per unit area, a series of experimental results shown in Table 1 show that it is in proportionality mostly. Moreover, if it raises that the maximum ablation force becomes large, i.e., picture gloss, as heat is fully supplied to a toner, toner viscosity is lowered and a toner is brought close to a melting flow state, in order to make a color toner color enough, needing the large ablation force is also confirmed.

[0045] It turns out that needing the larger ablation force than monochrome fixing from the above thing in color fixing has many (1) toner weights, and that it is based on two factors of making [high]-(2) picture gloss **.

[0046] it is shown in Table 1 -- as -- the toner weight in color fixing -- 2.0 mg/cm² from -- 0.65 mg/cm² of the same grade as the case of monochrome fixing up to -- by making it decrease, the ablation force can be reduced to 10-20g of the same grade as black and white

[0047] However, since picture gloss falls from 80 gross (75 degree-75 degree measurement) to 15 gross (75 degree-75 degree measurement) of the same grade as the case of monochrome fixing and the quality of a color picture deteriorates sharply as a result, such a policy cannot be taken.

[0048] Then, this invention persons performed examination about a fixing roll, in order to enable it to apply an ablation sheet also to color fixing. First, paying attention to the surface structure of a fixing roll, the so-called ablation force of the so-called hard roll with which the fluorine system resin layer was formed in the front face, and the soft roll with which the elastic layer was formed in the front face was measured. The ablation force measuring device shown in drawing 3 was used for the measuring device.

[0049] Table 2 is as a result of [which covered silicone level-status-register rubber with 0.1mm - 1.0mm / in thickness /, and a rubber degree of hardness of 25 degrees as an elastic layer to the core made from aluminum with a diameter of 40mm, and covered the fluorine system resin layer on the elastic layer front face further as a fixing roll / at the time of performing color fixing using the so-called soft roll] measurement. The PFA tube

with a thickness of 20 micrometers is used as a fluorine system resin layer.

[0050]

[Table 2]

	トナー	弹性層厚さ (mm)	表面層厚さ (μm)	最大剥離力 (g)
カラ一定着 (シリコーン弹性層 + フッ素樹脂表面 層の弹性体ロール)	A Color トナー + Wax (2.0mg/cm ²)	0	(PFAチューブ)	130
		0.15		90
		0.30		65
		0.50		60
		1.0		55

[0051] The critical load which can stabilize and exfoliate the maximum ablation force when elastic layer thickness is 0.3mm or more, although the maximum ablation force is over the above-mentioned critical-load:70g when the thickness of the elastic layer (silicone rubber) of a fixing roll is less than 0.3mm as shown in Table 2: It can be made to fall to the level of 70g or less.

[0052] Therefore, with the conventional soft roll, what elastic layer thickness was made to increase to 2mm - about 3mm, and the ablation force was reduced or less to about 10g, and was performing ablation by self stripping can be considered as the soft roll which has an about a little more than 0.3mm thin elastic layer by this invention. Usually, by the elastic layer having enabled thermal conductivity to make elastic layer thickness of a soft roll thin by the low's, since the heat source with which the interior of a fixing roll is equipped can be made small and the path of a fixing roll also becomes small, it becomes possible to miniaturize fixing equipment.

[0053] As explained above, by using the fixing roll with which the elastic layer was formed in the front face shows that the ablation force can be reduced sharply. Moreover, the critical load which does an injury for the ablation force to neither a form nor an ablation sheet: It is possible to make it fall to 70g or less, and an ablation sheet can be applied to the fixing equipment of a color picture recording device.

[0054] Inside a nip, it is deforming so that an elastic layer may wrap in a toner image, when a pressure is opened wide at a nip outlet, deformation of an elastic body tends to return, a micro slip takes place by the interface of a toner image and an elastic body, and the mechanism to which the ablation force falls to a fixing roll front face by covering an elastic layer is considered to be for this micro slip to reduce the ablation force. Therefore, elastic layer thickness required to reduce the ablation force will call it the thickness which an elastic layer can deform so that the toner layer height on a form may be absorbed in an elastic layer and a toner may be wrapped in. If toner layer height is less than 10% of elastic body layer thickness when an elastic layer is pressurized inside a nip, a part for toner layer height is absorbable. Considering that the maximum toner layer height in color picture formation is about 30 micrometers, required elastic layer thickness will call it 0.3mm or more.

[0055] By the way, although the fluorine system resin layer acts in the direction which bars elastic deformation when a fluorine system resin layer is formed in an elastic layer front face, if fluorine system resin layer thickness is about 30 micrometers or less below toner layer height that is, it is rare [it] to reduce the toner layer height absorptance of an elastic body.

[0056] The fixing equipment which can perform ablation stabilized without application of an ablation sheet could reduce the ablation force below to the possible value, and doing an injury to a picture, a form, and a fixing roll also by the case of color fixing when a fluorine system resin was covered on an elastic layer front face from the above thing that elastic layer thickness should just be 0.3mm or more and the thickness was 0.03mm or less is realizable.

[0057] Table 3 is as a result of [of the ablation force at the time of performing color fixing to the core made from aluminum with a diameter of 40mm as a fixing roll only using the soft roll which covered silicone rubber with a thickness of 0.3mm as an elastic layer] measurement. The ablation force measuring device shown in drawing 3 was used for the measuring device.

[0058] In this case, since it does not have the surface layer of a fluororesin like the fixing roll of Table 2, when not supplying oil to a fixing roll front face at all, the front face of silicone rubber is worn out for a short time, and cannot bear practical use. Then, it was established supplying the oil of 1 mg/A4 size paper - 10 mg/A4 size paper to a fixing roll front face, and the ablation force was measured.

[0059]

[Table 3]

トナー	最大剥離力 オイル供給量 (mg/A4サイズ紙)	最大剥離力					
		0	1	5	10		
		カラーフィニッシュ (シリコン弹性層 だけの弹性体ローラー)	A Color トナー + Wax (2.0mg/cm ²)	65g (摩耗)	20g	5g	1g

[0060] Since wear of silicone rubber will cause picture degradation if fixing is continued with oil not supplied, although ablation force:65g measured value is obtained when the oil amount of supply is zero as shown in Table 3, it cannot be established on this condition. However, by supplying the slight oil about 1 mg/A4 size paper to a fixing roll front face, wear of silicone rubber can be prevented and the ablation force can be reduced sharply. If the oil amount of supply is made to increase furthermore and it is the oil amount of supply of 10 mg/A4 size paper of the same grade as the conventional color fixing, although the ablation force can be reduced to the field near self stripping, if the oil amount of supply increases, an ablation sheet will scratch oil, the nose of cam of an ablation sheet will get wet in oil, it is imprinted at the nose of cam of a form, and there is a possibility that the trouble of an oil stain may occur. Therefore, in the case of fixing equipment equipped with the ablation sheet, the oil amount of supply needs to make it practically below 1 mg/A4 size paper. As shown in Table 3, even when the oil amount of supply is 1 mg/A4 size paper, the ablation force is 20g, and it is possible to apply an ablation sheet.

[0061] Thus, although it is possible to reduce the ablation force by supplying the oil of a small amount to a fixing roll front face also with the fixing roll with which a fluorine system resin layer was not formed in the elastic layer front face, but only the elastic layer was formed. If oil is used as mentioned above, oil will sink into the interior of a fixing roll, reduce reliability or Since the facility for supply of oil is required or it is easy to start the problem of oil remaining and reducing the retouch nature in a ball-point or ink on a copy, as shown in Table 2, it is desirable to use the fixing roll with which the fluorine system resin layer was formed in the elastic layer front face of a fixing roll.

[0062] In addition, it is possible to reduce the ablation force in an abbreviation half by supplying the amount of oil of 1 mg/A4 size paper to an elastic layer front face also by the case of the fixing roll which has a fluorine system resin layer. In order to avoid trouble generating of an oil stain also in this case, as for the oil amount of supply, it is desirable to set below to 1 mg/A4 size paper.

[0063] Next, the operation gestalt of the 2nd fixing equipment of this invention is explained.

[0064] Drawing 4 is the cross section of the ablation sheet used for the 2nd fixing equipment of this invention.

[0065] The ablation sheet 13 used for the 2nd fixing equipment of this invention is shown in drawing 4. The 1st body of revolution which the 2nd fixing equipment of this invention has a heat source inside like the 1st fixing equipment of this invention, and is rotated in the predetermined direction, It has the 2nd body of

revolution rotated in the direction opposite to the hand of cut of the 1st body of revolution while contacting the 1st body of revolution. Although it pressurizes while heating the form which supports a non-established toner image on the front face of the side in contact with the 1st body of revolution by which these two body of revolution has been conveyed by the nip section which comes to contact mutually, and a non-established toner image is fixed to a form. The 2nd fixing equipment of this invention is different from the 1st fixing equipment of this invention in the following two points.

[0066] The 1st difference is a point which is different from the ablation sheet 7 (refer to drawing 1) with which the 1st fixing equipment of this invention is equipped with the composition and the operation of the ablation sheet 13 with which the 2nd fixing equipment of this invention is equipped. Namely, the ablation sheet 13 with which the 2nd fixing equipment of this invention is equipped While having the contact section 15 which contacts fixing roll 1 front face by the downstream of the hand of cut A of the 1st body of revolution 1 from the nip section N of the fixing roll 1 (the 1st body of revolution) Rather than the contact section 15, it has the configuration further prolonged in the upstream of the hand of cut A of the fixing roll 1, and from fixing roll 1 front face, point 13a prolonged in the upstream separates a predetermined gap, and is arranged.

[0067] Although it was indispensable requirements that the 2nd difference is equipped with the elastic layer 3 (refer to drawing 1) formed in the front face of a fixing roll in the 1st fixing equipment of this invention, with the 2nd fixing equipment of this invention, equipping the front face of a fixing roll with an elastic layer is the point that they are not indispensable requirements.

[0068] As shown in drawing 4, the ablation sheet 13 of this operation gestalt The polyimide film with a thickness of 40 micrometers with which the fluorine system resin layer 19 with a thickness of 10 micrometers was formed in the one side is made into a base material 18. Field 19a in which the fluororesin layer 19 was formed in the base material 18 is carried out outside, and it is arranged so that point 13a of the side in which the fold of the layered product was formed in the layered product which formed by making it double fold may turn to the nip section N. In addition, a base material 18 is not restricted to a polyimide film, and a heat-resistant sheet plastic or a metal sheet can be used for it.

[0069] The thickness of the ablation sheet 13 used as the layered product is about 100 micrometers, some swelling formed by having folded the ablation sheet 13 in two exists in edge 13a by the side of the nip section N, and the portion of this swelling forms the contact section 15 in contact with the fixing roll 1 in it. The thickness of the ablation sheet 13 in this about 15 contact section is about 110 micrometers.

[0070] Other-end marginal 13b of the ablation sheet 13 has pasted up, as the base material 18 folded in two put the support plate 14. The length from edge 13a by the side of the nip section N of the ablation sheet 13 to edge 13b of the side currently supported on the support plate 14 is 5mm. The width of face of fixing roll 1 shaft orientations of the ablation sheet 13 is set as the width of face which covers the whole form width of face to pass. The ablation sheet 13 is in the state supported by the support plate 14, and it is arranged so that the contact section 15 formed near [the] the edge 13a may be pressed to the fixing roll 1.

[0071] The detachability ability of the ablation sheet 13 of this operation gestalt is the same as that of the detachability ability of the ablation sheet 7 (refer to drawing 1) in the 1st operation gestalt almost.

[0072] In the fixing equipment of this operation gestalt, there is a possibility that the contact section 15 of the ablation sheet 13 may touch the fixing roll 1, and the offset toner on the fixing roll 1 may adhere to the ablation sheet 13. Then, ablation sheet 13 front face is covered with the good fluorine system resin layer 19 of a mold-release characteristic so that an offset toner cannot adhere to the ablation sheet 13 easily.

[0073] Here, how the ablation sheet which covered the front face of the point of an ablation sheet with the fluorine system resin layer is produced poses a problem. Although how to cut the sheet-like polyimide base material which covered the fluorine system resin as the easiest production method, and use as the ablation sheet of predetermined size can be considered, since a fluorine system resin does not exist in the cutting plane of a base material by this method, it adheres [a toner / tend] to the portion and is not desirable. Moreover, although how to cover a fluorine system resin to each base material is also considered after preparing the base material cut in predetermined size by cutting, the part where a fluorine system resin cannot be easily covered with this method by a cutting plane, especially the edge section, and the fluorine system resin is not locally covered with it may be made.

[0074] On the other hand, with the ablation sheet 13 produced by the double fold method of this operation gestalt shown in drawing 4, the fluorine system resin layer 19 of predetermined thickness is formed also in edge 13a by the side of the nip section N of the ablation sheet 13, and adhesion of a toner is prevented. Moreover, since it is produced by the double fold method, it is the configuration which the edge which sharpened in edge 13a is not formed, and is hard scratching an offset toner. Therefore, when the toner image on Form P (refer to drawing 1) offsets in large quantities on the fixing roll 1, almost all offset toner and paper powder will rotate one time, adhered to the fixing roll 1, and it will be away held by Form P after that, and it is prevented that the ablation sheet 13 becomes dirty. Since the nose of cam of the form P supplied to the nip section N next contacts the toner and paper powder which were accumulated at edge 13a and has outside the plane away even if some of offset toners and paper powder may be accumulated temporarily at edge 13a of the ablation sheet 13, the dirt of the ablation sheet 13 is prevented.

[0075] The ablation sheet 13 of this operation gestalt has the advantage of being hard to attach a blemish to the toner image surface though the toner image T on Form P is ground against the nose of cam of the ablation sheet 13 in case it exfoliates since point 13a has smooth and big curvature. Moreover, since it is the same, the ablation sheet 13 of this operation gestalt has structure which cannot attach a blemish easily to the fixing roll 1. Furthermore, with curvature with this ablation sheet 13 big nose of cam, the probability that the nose of cam of Form P will collide head-on with the nose of cam of the ablation sheet 13 can decrease, it can be stabilized more, and Form P can be exfoliated.

[0076] For the above reason, 70g [in / the 1st fixing equipment / in the maximum ablation force i.e., the critical load which can stabilize and exfoliate, in which it explained with reference to Table 2] can be raised even to 150g with this operation gestalt. Therefore, in this operation gestalt, it is not necessary to necessarily form an elastic layer in the front face of the fixing roll 1.

[0077] Furthermore, with the ablation sheet of this double fold method, heating at the heater built in the fixing roll 1 becomes a cause, and the merit of being hard to generate the flapping phenomenon which is easy to generate in the edge of an ablation sheet also has it. a contact pressure [actually as opposed to the fixing roll 1 of the ablation sheet 13] -- about [of the contact pressure in the case of the ablation sheet 7 (refer to drawing 2) of a monolayer] -- it is confirmed that lenticulate even if it makes it decrease even to one half, and a phenomenon does not arise, and it is possible to reduce the contact pressure in the case of being A4 horizontal size form width-of-face:297mm even to 30g

[0078] If the point S that the form P which passed the ablation point S N, i.e., the nip section, with which the ablation sheet 13 exfoliates from the fixing roll 1 exfoliated from the fixing roll 1 separated from the outlet of the nip section N and it has passed, since the time supported while Form P had coiled around the fixing roll 1 will become long, the point of the toner picture on Form P may be overheated, a gross may become high, and gross nonuniformity may produce in the point of

[0079] At the time of the usual image formation, there is a non-image formation field in which a picture is not formed at the nose of cam of the form which supported the toner picture. The length from the form nose of cam of this non-image formation field is about about 5mm, although there are some differences with image formation equipment. In process in which a form comes out from the nip section, if a form nose of cam begins to exfoliate with the ablation sheet 13 before the nose of cam of a toner picture comes out of the nip section, the above-mentioned gross nonuniformity will not be produced.

[0080] then, the gross nonuniformity which boils and changes various positions of the ablation point S, and is generated at the nose of cam of a toner picture was investigated The result is shown in Table 4. Here, the nip width of face of the fixing roll 1 and a pressure roll 6 is 6mm.

[0081]

[Table 4]

	ニップ出口から剥離ポイントまでの距離				
	3 mm	4 mm	5 mm	6 mm	7 mm
グロスマラ	○	○	○	×	×

[0082] If the distance from the outlet of the nip section N to the ablation point S becomes longer than length:5mm of the non-image formation field of a form so that clearly from Table 4, gross nonuniformity will begin to arise in the point of a toner picture. If the distance from the outlet of the nip section N to the ablation point S is 6mm or less, the problem of gross nonuniformity will not occur.

[0083] That is, in order to prevent generating of gross nonuniformity, it is desirable to make a form the distance from a nip section outlet exfoliate from the 1st body of revolution (fixing roll) in a position shorter than the length of the non-image formation field at the nose of cam of a form.

[0084] In addition, you may use the following ablation sheets as a modification of the 2nd operation gestalt.

[0085] Drawing 5 is drawing showing the modification of the ablation sheet shown in drawing 4.

[0086] As shown in drawing 5, this ablation sheet 13' The heat-resistant sheet plastic or metal sheet with which the fluorine system resin layer 19 was formed in one side as well as the ablation sheet 13 shown in drawing 4 is made into a base material 18. It is formed as a layered product which folded in half by ****ing outside the field in which the fluorine system resin layer 19 was formed in the base material 18. among these base-material 18 folded in half By making the particle 20 of a globular form with a diameter of 5-100 micrometers or a cylindrical shape intervene, the swelling in alignment with edge 13a' of the side in which the fold of ablation sheet 13' was formed is made, and contact section 15' of size **** is formed rather than the contact section 15 in the ablation sheet 13 shown in drawing 4. A particle 20 is put among base-material 18 folded in half at intervals of 10mm along with edge 13a[of ablation sheet 13']. In addition, you may make it paste up base-material 18 folded in half by the binder. Thus, constituted ablation sheet 13' has the same detachability ability as the ablation sheet 13 shown in drawing 4.

[0087] Next, the 3rd operation gestalt of the fixing equipment of this invention is explained.

[0088] When continuation fixing operation of hundreds of sheets is made to perform using the fixing equipment of the 1st or 2nd operation gestalt, the offset toner and paper powder of an amount may be accumulated a little temporarily at the edge of an ablation sheet, and the phenomenon in which they are removed by the form point sent to the degree may be seen. Consequently, the nose of cam of a form will be soiled somewhat and is not desirable for picture quality. In such a case, it is desirable to use the ablation sheet of the 3rd operation gestalt explained below.

[0089] Drawing 6 is the cross section of the ablation sheet used for the 3rd operation gestalt of this invention.

[0090] As shown in drawing 6, the fluorine system resin layer 29 with a thickness of 10 micrometers is covered by the base material 28 of a polyimide film with a thickness of 75 micrometers, this ablation sheet 27 is formed in it, two or more salients 30 which have a cone type configuration with a height of 20 micrometers are formed in field 27b of the side which counters the fixing roll 1 of the ablation sheet 27, and the salient 30 of these plurality touches the fixing roll 1. Salient 30 is about 20 micrometers in height, and can be formed by making it push and deform plastically with a mold from field 27c of the opposite side of field 27b of the side which counters the fixing roll 1 of the ablation sheet 27. Thus, by making a base material 28 deform plastically and forming two or more salients, since it becomes possible to obtain the ablation sheet which has a salient comparatively easily and cheaply, it is desirable.

[0091] Drawing 7 is the plan of the ablation sheet shown in drawing 6.

[0092] As shown in drawing 7, the salient 30 is formed in field 27b of the side which counters the fixing roll 1 of the ablation sheet 27 at intervals of 10mm in parallel with fixing roll 1 shaft orientations.

[0093] Drawing 8 is the plan showing the modification of the ablation sheet of the 3rd operation gestalt, and drawing 9 is the plan showing other modifications of the ablation sheet of the 3rd operation gestalt.

[0094] drawing 8 -- being shown -- as -- ablation -- a sheet -- 27 -- ' -- a top -- plurality -- a salient -- 30 -- ' -- alternate -- arranging -- making -- things -- this invention -- fixing -- equipment -- being desirable -- a mode -- one -- a ** -- it is -- moreover -- drawing 9 -- being shown -- as -- ablation -- a sheet -- 27 -- " -- forming -- having had -- plurality -- a salient -- 30 -- " -- fixing -- a roll -- one -- a hand of cut -- meeting

[0095] Next, the interval of two or more salients which can be set in the 3rd operation gestalt is explained.

[0096] As shown in drawing 6, the ablation sheet 27 in the 3rd operation gestalt touches the fixing roll 1 by the salient 30 near the edge 27a, and is in the state where the about 20-micrometer gap was maintained between edge 27a of the ablation sheet 27, and the fixing roll 1. Since the ablation sheet 27 uses the thin film

film as a base material 28, if its interval of salient 30 is too large, edge 27a of the ablation sheet 27 between salients will contact the fixing roll 1. In order to prevent this, as for the interval of salient 30, it is desirable to take into consideration balance with the thickness of the ablation sheet 27, and to be referred to as about 3-30mm. Next, the height of the salient from the ablation sheet front face in the 3rd operation gestalt is explained.

[0097] Various height of salient 30 is changed into Table 5 using the ablation sheet 27 shown in drawing 6, and the result which investigated about detachability ability is indicated to be accumulation dirt of the toner and paper powder to the ablation sheet 27 to it. As shown in drawing 6, since the salient 30 is formed near the edge 27a of the ablation sheet 27, the gap of edge 27a of the ablation sheet 27 and the fixing roll 1 is a grade [a little] smaller than the height of salient 30. If this gap becomes large, the form P which has passed the nip section N cannot enter between the ablation sheet 27 and the fixing roll 1, and cannot exfoliate from the fixing roll 1.

[0098]

[Table 5]

紙厚：100μ

剥離シートの端縁と定着ロールとの間隙							
	3 μ m	5 μ m	25 μ m	50 μ m	75 μ m	100 μ m	125 μ m
剥離フィルム の汚れ	△	○	○	○	○	○	○
剥離性能	○	○	○	○	○	○	×

[0099] If the gap of edge 27a of the ablation sheet 27 and the fixing roll 1 is 100 micrometers or less as shown in Table 5, sufficient detachability ability can be demonstrated. Moreover, if the height of a salient is set to less than 5 micrometers, an offset toner, paper powder, etc. will begin to adhere [come] to an ablation sheet gradually. Therefore, as for the gap of edge 27a of the ablation sheet 27, and the fixing roll 1, it is desirable to be referred to as 5 micrometers or more 100 micrometers or less.

[0100] In addition, in the 3rd operation gestalt, the salient formed in an ablation sheet may be a linear salient prolonged in the direction which meets the hand of cut of a fixing roll. By forming such a linear salient from near the point of an ablation sheet, the flexibility on the design to a delicate gap of the contact position of a salient and a fixing roll can be made to increase, and it is desirable.

[0101] In each above-mentioned operation gestalt, although the example using the roll as the 1st and 2nd body of revolution was explained, the 1st and 2nd body of revolution in the fixing equipment of this invention may not be restricted only to a roll, and may be belt type body of revolution.

[0102] Moreover, although the explanation in each above-mentioned operation gestalt has explained only the example which applied the ablation sheet of this invention to ablation of the form from the 1st body of revolution (fixing roll) In the image formation equipment in which a double-sided copy is possible, in case a double-sided copy is taken, it can apply like each above-mentioned operation gestalt also to ablation of the form from the 2nd body of revolution (with each above-mentioned operation gestalt, it is equivalent to a pressure roll 6).

[0103] [Effect of the Invention] As explained above, according to the 1st fixing equipment of this invention, the 1st body of revolution By having formed the elastic layer in the front face, and having had the ablation sheet which the edge is contacted on the 1st body-of-revolution front face at the hand-of-cut downstream of the 1st body of revolution, and exfoliates a form from the 1st body of revolution rather than the nip section The non-established toner image with which a lot of toners were imprinted and formed like color fixing Moreover fixing equipment equipped with the ablation sheet which can perform ablation stabilized without doing an injury to a toner image, a form, and the 1st body of revolution is realizable, according to the 2nd fixing equipment of this invention While having the contact section which contacts the 1st body-of-revolution front face by the downstream of the 1st body of revolution rather than the nip section of the 1st body of revolution By having the configuration further prolonged in the upstream of the 1st body of revolution rather than the contact section, and having had the ablation sheet with which the point prolonged in the upstream has been arranged by separating a predetermined gap from the 1st body-of-revolution front face Fixing equipment equipped with the ablation sheet which can stabilize and exfoliate the non-established toner image on the 1st front face of body of revolution can be realized without doing an injury to a toner image, a form, and the 1st body of revolution similarly in the 1st fixing equipment of this invention.

[Translation done.]